Course Syllabus

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BIOC 311 Advanced Experimental Biosciences
Spring 2018 Syllabus

Laboratory meetings (7 scheduled days of lab)

Scheduled from 1:00-5:00 pm, Anderson Biological Laboratories (ABL) 126

- Tuesday (001): begins 9-Jan-2018
- Wednesday (002): begins 10-Jan-2018

INSTRUCTOR

Dr. Beth Beason-Abmayr (bbeason@rice.edu (mailto:bbeason@rice.edu)): office hours are by appointment in ABL 326; please set-up an appointment by e-mail

This semester I will be conducting a study looking at teaching and learning. The purpose of this study is to determine the factors that influence teaching effectiveness and learning. Your participation in this study will last for the duration of the current semester and will entail activities no different from the regular activities you would otherwise engage in as part of the course. If you would like more information, please do not hesitate to ask. If you would like to opt out of the study, please talk to Dr. Beason as soon as possible.

COURSE OBJECTIVES AND LEARNING OUTCOMES

BIOC 311 further advances basic laboratory, record keeping, and technical communication skills that were introduced in BIOC 211: Intermediate Experimental Biosciences. Our emphasis is on the *process* of science (i.e., fundamental abilities and skills) rather than the *content* (i.e., discipline-specific lab techniques). **In this discovery-based course, students work in teams to complete part of a research project.**

Each semester the lab project focuses on protein purification and characterization. As we work with graduate students in Biochemistry and Cell Biology at Rice, the target protein may vary from semester to semester.

Overall learning goals and intended learning outcomes for the course are outlined below. As you look over the BIOC 311 goals and specific objectives below, please consider which areas represent your strengths, in which areas you want to strengthen your skills, and in which areas you have little or no experience. Return to this list later in the class to assess for yourself whether you are progressing towards these goals.

Goal 1: Possess basic and advanced laboratory skills desired of an independent researcher

Understanding the rationale behind procedures and asking questions that reflect a willingness to learn promote effective time management and successful completion of experiments. Our best students are always the ones who are engaged in the learning process. An independent researcher

- follows standard protocols to complete specific procedures
- performs logical troubleshooting of laboratory procedures
- adheres to instructions on laboratory safety, and recognizes hazardous situations and acts appropriately
- uses and stores equipment properly
- handles lab reagents and solutions sensibly
- performs basic lab calculations to prepare solutions and samples for experiments
- measures and reports uncertain quantities with appropriate precision
- applies appropriate methods of analysis to raw data
- converts raw data to a physically meaningful form with appropriate units

Goal 2: Understand the importance of effective communication and of detailed and accurate record keeping

Communication and record keeping are fundamental to the dissemination of science. A student who is an effective communicator

- maintains a timely, comprehensive laboratory notebook with sufficient detail to repeat experiments, troubleshoot procedures, and analyze data
- shares information orally
- writes effectively in appropriate style and depth
- makes effective use of information resources

Goal 3: Recognize the importance of discipline and responsibility when working in a professional environment

In addition to working independently, each student is expected to work well with each member of a team. A disciplined and responsible student

- employs all available resources to prepare for laboratory work
- takes the initiative to note when assignments are due and completes them on time
- follows instructions for completion of assignments and execution of lab procedures
- works independently but seeks help when appropriate
- works effectively as part of a team and divides lab responsibilities to complete work in a timely manner
- admits when mistakes or errors are made and accepts responsibility for actions
- learns from mistakes as well as successes and is open to suggestions from teammates, TAs, or the instructor
- recalls routine procedures without having to consult a teammate, TA, or instructor
- takes the initiative to refresh past understanding of methods, procedures, explanations, and theory
- shares specific observations and experiences with teammates
- when necessary, picks up responsibilities if partner is unable to carry them out

Goal 4: Experience that not all scientific experiments work as planned

Many scientific experiments do not work as planned and often yield either no results or findings that conflict with or differ from previous experiments. Our teaching labs in BioSciences provide a "safe" and nurturing environment where a student can

- respond to questions that require troubleshooting of experimental methods or data collection
- use laboratory notes and observations to evaluate the success of experiments and identify potential errors when outcomes are unanticipated
- make corrections or alterations after missteps in experimental procedures, adjusting their schedule or research plan appropriately
- observe how other students report errors in posters or presentations

Goal 5: Recognize appropriate context and understand how to report meaningful data

Paying attention to detail is important not only in performing experimental procedures but also in reporting the results to the scientific community and the general public. A meticulous and focused student

- recognizes the relevance of data
- relates laboratory work to the bigger picture
- recognizes the applicability of scientific principles to real world situations
- considers how seemingly minor oversights or mistakes can have serious consequences

Goal 6: Integrate and apply knowledge/experience to current and future work

On the path to become a self-reliant critical thinker, problem solver, and communicator, a student progresses through several proficiency levels. A highly proficient student recognizes when the current skill level is not

adequate to handle a particularly complex problem, and EFFECTIVELY seeks resources to acquire the needed skill. A student's present level of achievement and success is a reflection of past experiences and opportunities that have been made available as well as self-confidence. A successful student

- retains facts, methods, and principles learned in science and math courses and applies that information to another course, even in a different discipline
- uses critical thinking in the laboratory by making observations, drawing conclusions supported by the data, and acting upon those conclusions
- recognizes whether results and conclusions "make sense"
- figures out what "tools" to use when presented with a particular problem or task

Required Text and Resources

- Victoria E. McMillan, *Writing Papers in the Biological Sciences*, Fifth Edition (2012) or Sixth Edition (2017), Bedford/St. Martin's
- **Canvas**: modules, course videos, supplemental resources, pre-lab exercises and other assignments, announcements, grade postings, class calendar, and more

Recommended Text

- *Protein Purification: Principles and Practice*, Third Edition (1994) Robert K. Scopes (Springer-Verlag New York , Inc.)

Required Materials

- ballpoint pen (not felt-tip or gel)
- safety GLASSES (NOT goggles)
- computer

Preparation

Each week while the course meets formally you are expected to prepare for each discussion and laboratory session.

For pre-lab discussions:

- Read over the material in Canvas and any additional materials and identify any questions for the instructor
- Watch the appropriate videos (links are in Canvas Files)
- Obtain necessary information about techniques from the resources provided

- Come to each lab prepared to answer questions and evaluate your knowledge about the techniques, safety issues, scientific theory, and experimental significance

For laboratory work:

- Read the rules for safe conduct in the laboratory (see **Rice BioS_Lab safety and conduct.pdf**) before the first lab session and be aware of special safety concerns for each lab meeting
- Use resources to ensure that you know what we are doing and why we are doing it
- Prepare an outline (procedure, notes, calculations) so that you are ready to perform labwork
- Complete and submit online pre-laboratory assignments before coming to lab sessions
- Record your prelaboratory calculations in your notebook when applicable
- *Take notes in your team lab notebook*: the lab notebook will remain in the lab at all times throughout the semester; at the end of each lab, designate a team member to take photos of the pages and upload them to your team page in Canvas.

Follow-up work:

- Monitor assignment due dates each week to ensure that you are aware of upcoming assignments
- Check e-mail and Canvas Announcements frequently for new or updated class information

NOTE: You are responsible for printing procedure information and additional resources for each day of lab (i.e., there are no handouts). Please see Canvas for further details. Please bring your personal computer to lab with you.

ATTENDANCE POLICIES

Attendance at all laboratory meetings is required. Absences may be excused due to illness or unexpected/unavoidable emergencies; students are expected to contact the instructor by email as soon as possible in the event of an emergency. Make-up lab sessions are unable to be offered.

ASSESSMENT AND GRADING

All work is to be completed individually unless otherwise specified. You must submit paper and/or electronic copies of homework and the research paper drafts/final version by the specified time on the due date. **For full credit, all assignments must be submitted on time. The penalty for late assignments is 10% of the total score per 24-hour period past the deadline.** Due dates for assignments are listed in Canvas; these dates are subject to change. Do not ask for an individual extension to a due date because you have a paper due, or three exams, or your computer crashed; due dates are set so that you have plenty of time to complete your work. Don't wait until the night before to start - there is no penalty for starting early. ***It is your responsibility to plan ahead.***

Although in the real world there are often no excuses, you will be given a break on assignments due to

circumstances that are truly beyond your control. *Alternative due dates will be worked out with the instructor on an individual basis.* Here are examples of **permissible reasons for a late submission**:

- A *serious* illness (flu is serious - upset stomach or case of the sniffles is not) or accident
- A *serious* family emergency or death (you are on your honor here)
- Other unusual circumstances may count also. For example, if the university closes due to flooding on the date the work is due.

Pre-lab exercises and Reflections are submitted in Canvas in "Quizzes": although there is no time limit for completing these, you are allowed a single submission. Please check Canvas for the Release/Due Dates; you must submit your work during this time frame to get full credit. *You must complete all of the pre-lab exercises ALONE* (i.e., do not work on the pre-lab with anyone else); you may use your class notes/web sites/Scopes, etc.; have a calculator and pen/pencil with scratch paper on hand as you answer the questions.

FREEBIE: You have the *option* of taking ONE two-day extension for ONE section draft in BIOC 311. Please notify me by e-mail if you decide to take this extension. I encourage you to hold onto this option in case something unexpected arises around a due date for a section draft – if you have an issue arise, please use your free extension first; if you need additional time, please contact me so we can discuss your situation.

Contributions of assignments to the final course grade are as follows:

Assignment	Weight (%)
Research Paper (drafts and final revised version)	35
Laboratory Notebook (Team)	25
Laboratory Citizenship and Performance	25
Engagement & Participation: Reflections, Pre-Labs, Homework	15

The final weighting for each category is subject to change at the discretion of the instructor; after all assignments have been graded, the instructor may change the weighting to raise final course grades.

Major Assignments	Due Date

Pre-lab Quizzes (Canvas)	Before the start of each lab (Canvas)
Reflections (Canvas)	See Canvas
Homework	See Canvas
Notebook Days 1-3, Table of Contents	End of lab day 3
Notebook Days 4-7, Final pages, Table of Contents	8-Mar-2018 (4 pm)
Draft: Materials and Methods	Beginning of lab day 6
Draft: Introduction	Beginning of lab day 7
Draft: Results and Discussion (*combined*)	6-Mar-2018 (4 pm)
Research Paper: Final Revised Version	5-Apr-2018 (4 pm)

Communication Instruction

Both written and oral communication are emphasized in this course. As a team, you will maintain a laboratory notebook to academic standards (see description below and in Assignments); your notebook will be graded at least twice during the semester. Ongoing verbal communication with your teammates during lab is essential for promoting a strong team dynamic and critical for completing the procedures in lab and analyzing the data.

We intend to use the overall quality of the laboratory notebook and your specific notebook entries to evaluate your effort. Describe all procedures that you perform in sufficient detail to repeat the experiment and record any raw data. Remember to describe any problems encountered or unexpected results. See **Laboratory Notebook Guidelines.pdf** and the **BIOC 311 Notebook Checklist.pdf** for specific evaluation criteria. *Each team will maintain a single laboratory notebook - notebooks will be given to you on the first day of lab*:

- ***Each team member is expected to make daily entries in the notebook during each lab.*** *A single team member must not, for example, act as a recordkeeper by writing in the notebook while the others*

carry out the work. You may want to take turns writing the *Objectives/Daily Summary* for each lab day. Take turns recording information during lab and initial at the end of each entry by a different member of the team. At the end of the session, remember to draw a line through any remaining blank spaces.

- When you finish for the day, record the time on the final page and draw a line through any remaining blank spaces.
- *It is absolutely critical that you record details such as WHO did WHAT (e.g., loading samples on the gel, setting up PCR, etc.) and LABELS on your samples.* You must have this information in your notebook to determine where a procedural error(s) occurred and to use the correct sample for that day's procedures.
- Remember, **do NOT "pre-write" objectives or methods in your notebook BEFORE you come to lab.**
- *You must have a TA initial/date the LAST notebook page for each lab session BEFORE leaving lab EACH day.*

As an individual, you will write a Research Progress Report; you will submit a draft of each section of the report and will have the opportunity to revise your work based on feedback from the instructor.

You are encouraged to make appointments with the peer consultants at the Center for Written, Oral, and Visual Communication (CWOVC) for your communication assignments in this course. These consultants do not proofread or edit your work, but they will provide feedback on topics such as the organization of your paper, the coherence of your argument, and appropriate sentence structure. NOTE: For this course you are NOT allowed to work with a consultant who is a biosciences major or to get any assistance with the content of the assignment. You can make an appointment at the Center's website: **cwovc.rice.edu (http://cwovc.rice.edu/)** . Please consult with Dr. Beason if you have any questions.

Evaluation of Performance

We expect students to follow explicit instructions and to recall and apply previous training to each new project. Puncutality, safe conduct in the laboratory, and efficient completion of responsibilities will enter into the evaluation of overall performance. Read about our expectations and performance criteria in **lab citizenship_2017.pdf** .

HONOR CODE POLICY

All students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. Consult the Honor System Handbook at **http://honor.rice.edu/honor-system-handbook/ (http://honor.rice.edu/honor-system-handbook/)** for details about this code and how it is administered. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

When you turn in an assignment, you must be able to make the statement, "On my honor, I have neither given nor received any unauthorized aid on this assignment." This pledge applies to notebook entries, pre-

lab quizzes/exercises, homework assignments, section drafts, and the final paper. For detailed information, see the link on the course web site.

All pre-laboratory quizzes, homework, reflections, lab notebook, and writing assignments must represent your individual work unless specified otherwise. You will perform lab work as teams and are encouraged to share responsibilities of data collection and analysis. While you may discuss data calculations with teammates, when you begin writing the paper, you should not work together on or share ideas about specific information to include in text, formatting and/or content of figures and tables. The Writing Center's mentors may be consulted about the clarity and quality of your writing; however, those mentors should focus on your writing without providing comments about scientific content. Additional honor code details for written assignments are included with the assignment. The following applies to all written assignments: No one is to have access to any other student's paper for this course, from this semester or from any previous semester. When assignments are prepared by teams, no team is allowed access to another person's or another team's written assignment as described above. Thus, it is both a violation to provide or post material not provided by the instructor or to use similar material for your own benefit. If you find that previous papers are posted on the web, kept in college libraries, or available in any other form, please report the suspected violation to the honor council.

STUDENTS WITH DISABILITIES

Course material will be delivered either digitally (online or email) or in person and may be visual (written documents, slides, videos, etc.), audio (videos, presentations, discussions), or interactive (questions, discussions, clickers, etc.). Course work will require answering questions online, safely performing laboratory procedures, writing in lab notebooks, typing papers, reading written materials, discussing material with peers, and may include light lifting and sitting for extended periods of time. Some interactive portions of lectures will not be available online; thus, students should choose or request seating where they are best able to view and hear presented materials.

Any student with a documented or suspected disability needing academic adjustments or accommodations is requested to *contact the instructor in person or by email before the first day of class*; all discussions will remain confidential. Students with disabilities should also contact Alan Russell (**alan.g.russell@rice.edu (mailto:alan.g.russell@rice.edu)**), Director, Disability Support Services (713-348-5841) before the first day of class.

Information contained in this course syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Course Summary:

Date	Details	
Tue Jan 9, 2018	**Pre-Lab 1: Introduction and Bacterial Transformation (https://canvas.rice.edu/courses/9949/assignments/56494)** (BIOC 311 001 Sp18)	due by 12:30pm
Wed Jan 10, 2018	**Pre-Lab 1: Introduction and Bacterial Transformation (https://canvas.rice.edu/courses/9949/assignments/56494)** (BIOC 311 002 Sp18)	due by 12:30pm
Thu Jan 11, 2018	**Reflection 1 (https://canvas.rice.edu/courses/9949/assignments/56490)**	due by 11:59pm
Tue Jan 16, 2018	**Pre-Lab 2: Protein Expression (https://canvas.rice.edu/courses/9949/assignments/56489)** (BIOC 311 001 Sp18)	due by 12:30pm
Wed Jan 17, 2018	**Pre-Lab 2: Protein Expression (https://canvas.rice.edu/courses/9949/assignments/56489)** (BIOC 311 002 Sp18)	due by 12:30pm
Tue Jan 23, 2018	**Pre-Lab 3: Bacterial Lysate Preparation (https://canvas.rice.edu/courses/9949/assignments/56493)** (BIOC 311 001 Sp18)	due by 12:30pm
	Notebook Days 1-3 (https://canvas.rice.edu/courses/9949/assignments/56503) (BIOC 311 001 Sp18)	due by 5pm
Wed Jan 24, 2018	**Pre-Lab 3: Bacterial Lysate Preparation (https://canvas.rice.edu/courses/9949/assignments/56493)** (BIOC 311 002 Sp18)	due by 12:30pm
	Notebook Days 1-3 (https://canvas.rice.edu/courses/9949/assignments/56503) (BIOC 311 002 Sp18)	due by 5pm
Tue Jan 30, 2018	**Pre-Lab 4: Batch Purification and Protein Tags (https://canvas.rice.edu/courses/9949/assignments/56488)** (BIOC 311 001 Sp18)	due by 12:30pm
Wed Jan 31, 2018	**Pre-Lab 4: Batch Purification and Protein Tags (https://canvas.rice.edu/courses/9949/assignments/56488)** (BIOC 311 002 Sp18)	due by 12:30pm
Thu Feb 1, 2018	**Draft 1: Materials and Methods (https://canvas.rice.edu/courses/9949/assignments/56497)**	due by 11:59pm
Mon Feb 5, 2018	**Reflection 2 (https://canvas.rice.edu/courses/9949/assignments/56491)**	due by 11:59pm

	(BIOC 311 001 Sp18)	
Tue Feb 6, 2018	Pre-Lab 5: Protein Determination, SDS-PAGE, and Electrophoretic Transfer (https://canvas.rice.edu/courses/9949/assignments/56487) (BIOC 311 001 Sp18)	due by 12:30pm
	Reflection 2 (https://canvas.rice.edu/courses/9949/assignments/56491) (BIOC 311 002 Sp18)	due by 11:59pm
Wed Feb 7, 2018	Pre-Lab 5: Protein Determination, SDS-PAGE, and Electrophoretic Transfer (https://canvas.rice.edu/courses/9949/assignments/56487) (BIOC 311 002 Sp18)	due by 12:30pm
Tue Feb 13, 2018	Pre-Lab 6: Western Analysis (https://canvas.rice.edu/courses/9949/assignments/56495) (BIOC 311 001 Sp18)	due by 12:30pm
Wed Feb 14, 2018	Pre-Lab 6: Western Analysis (https://canvas.rice.edu/courses/9949/assignments/56495) (BIOC 311 002 Sp18)	due by 12:30pm
Thu Feb 15, 2018	Draft 2: Introduction (https://canvas.rice.edu/courses/9949/assignments/56498)	due by 11:59pm
Tue Feb 20, 2018	Pre-Lab 7: Protein Purification Tables and Enzymatic Analysis (https://canvas.rice.edu/courses/9949/assignments/56492) (BIOC 311 001 Sp18)	due by 12:30pm
Wed Feb 21, 2018	Pre-Lab 7: Protein Purification Tables and Enzymatic Analysis (https://canvas.rice.edu/courses/9949/assignments/56492) (BIOC 311 002 Sp18)	due by 12:30pm
Fri Feb 23, 2018	Library Project (Team) (https://canvas.rice.edu/courses/9949/assignments/56502)	due by 11:59pm
Mon Feb 26, 2018	Rice Mid-Term Recess (https://canvas.rice.edu/calendar?event_id=14280&include_contexts=course_9949)	12am
Tue Feb 27, 2018	Rice Mid-Term Recess (https://canvas.rice.edu/calendar?event_id=14279&include_contexts=course_9949)	12am
Tue Mar 6, 2018	Draft 3: Results and Discussion (https://canvas.rice.edu/courses/9949/assignments/56499)	due by 4pm
	Notebook Days 4-7 & Final Analysis	due by 4pm

Thu Mar 8, 2018	(https://canvas.rice.edu/courses/9949/assignments/56505)	
Thu Apr 5, 2018	Final Paper (https://canvas.rice.edu/courses/9949/assignments/56500)	due by 11:59pm
Tue Apr 10, 2018	Reflection 3 (https://canvas.rice.edu/courses/9949/assignments/56496)	due by 11:59pm
Fri Apr 20, 2018	The LCAS Survey (https://canvas.rice.edu/courses/9949/assignments/61477)	due by 11:59pm
	Laboratory Citizenship and Performance (https://canvas.rice.edu/courses/9949/assignments/56501)	